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REMARKS

The specification and claims have been amended without adding new matter in order to correct minor informalities and to address other issues raised by the Examiner. Claims 3-4, 7-9, 14-15, 21-22, 24 and 28 have been amended. New claims 29-40 have been added without adding new matter. Forty (40) claims remain pending in the application: Claims 1-40. Reconsideration of claims 1-28 in view of the amendments above and remarks below and consideration of new claims 29-40 is respectfully requested.

By way of this amendment, Applicants have made a diligent effort to place the claims in condition for allowance. However, should there remain any outstanding issues that require adverse action, it is respectfully requested that the Examiner telephone the undersigned at (858) 552-1311 so that such issues may be resolved as expeditiously as possible.

Specification

1. The specification is objected to because of informalities. As suggested, "16" has been deleted on page 9, line 6. Thus, the objection should be withdrawn. Additionally, after checking the specification, a few additional corrections to informalities have been made.

Claim Objections

2. Claims 3-4, 7-9, 14-15, 21-22, 24 and 28 stand objected to for informalities. All changes have been made as suggested; thus, the objections should be withdrawn. Additional changes have been made to correct further informalities that do not substantively alter the scope of the recited claims.

Claim Rejections - 35 U.S.C. §102

3. Claims 1, 2, 5, 6, 9, 12, 16, 17, 20 and 23-26 stand rejected under 35 U.S.C. § 102(b), as being anticipated by U.S. Patent No. 5,704,700 (Kappel et al.).

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Kappel provides a laser illuminated image projection system that utilizes a projection light beam more efficiently than a conventional projector and shapes the projection light beam in such a way as to project an exceptionally brighter image to a display screen (see Abstract). Kappel describes a microlaser array 922 that provides pulsed light to a beam shaper 936 (see FIG. 9). Each laser is pulsed ON during the entire time during which that color (red, green, blue) laser is used during a frame, i.e., one pulse is provided per laser source per frame (see col. 15, lines 19-28). Kappel teaches that the pulsing of the microlaser source is for the purpose of reducing the duty cycle of the laser, thereby increasing the laser's operating life (see col. 15, lines 21-44). This provides a high average output luminosity at a low average energy cost (see col. 15, lines 7-12). The beam shaper 936 converts the Gaussian intensity profile (see FIG. 10) of each laser beam to a rectangular projection light beam having a uniform intensity profile (see FIG. 11). This rectangular light beam is directed to an analog modulator (e.g., light valve 942, light valve 42 within spatial light modulator 40, light valve 242 within spatial light modulator 240, and deformable mirror device 624) that modulates the light beam to provide an output light beam indicative of an image (see for example, col. 3, lines 26-27 and col. 4, lines 19-20). That is, the light valve controls the luminosity of the light projected by the light valve to produce grayscale in the image to be projected (see col. 10, lines 53-60). The light valves and spatial light modulators of Kappel are known analog modulators that modulate light by their analog behavior.

In contrast, regarding independent claims 1 and 5, claim 1 requires the step of "modulating said pulsed laser beam in an element of a spatial light modulator to gate a number of pulses corresponding to the grayscale level of said digital data, including transitioning said element substantially in an interpulse period between laser pulses", while claim 5 requires the step of "modulating said pulsed laser beam in a plurality of elements of a spatial light modulator to gate a number of pulses from each element corresponding to the grayscale level of said digital data for each pixel for each frame, including transitioning said elements substantially in an interpulse period

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between laser pulses, thereby providing a modulated beam".

The recited method describes a digital modulation technique in which a series of periodic light pulses is generated then a number of pulses are gated by an element of the spatial light modulator, the number of pulses gated corresponding to the grayscale level, and in which elements of the spatial light modulator are transitioned substantially during an interpulse period between laser pulses.

In contrast, Kappel does not disclose or teach gating a number of pulses corresponding to the grayscale level of digital data. Kappel teaches well known analog modulation that variably transmits a single pulse of laser light per color per frame to produce a grayscale image during that frame, i.e., Kappel does not gate pulses of incident light to provide grayscale. Furthermore, Kappel does not disclose or teach transitioning elements of a spatial light modulator during an interpulse period. It is inherent that whatever components of Kappel's light valves or spatial light modulators are transitioned to variably transmit light, these components must transition during a given laser pulse, not during an interpulse period. For example, in FIG. 6, the deformable mirror device 642 (which acts as a spatial light modulator (see col. 13, lines 49-50)) includes mirrors that transition between on and off states. Since there is only one pulse per frame for a given color laser, the transitioning of these mirrors must occur during a given laser pulse in order to create a grayscale in the projected light. Accordingly, Kappel does not describe that elements of a spatial light modulator are transitioned substantially during an interpulse period, as is recited. Kappel's pulsing is for the purpose of efficiently operating the laser sources and is unrelated to the modulation of the light to provide grayscale, other than to ensure that the laser is pulsed off when light from the laser is not to be used.

Thus, since Kappel does not disclose the recited modulating steps of claims 1 and 5, Karakawa does not anticipate the inventions as recited in claims 1 and 5. Therefore, it is respectfully submitted that the rejection is overcome and should be withdrawn.

Regarding independent claim 9, Kappel does not disclose "a modulation

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driver synchronized with a laser driver, said modulator driver controlling transitions between said first and second state of said elements, said transitions having a non-zero phase with reference to said laser pulses so that said transition intervals occur in interpulse periods", as recited.

As described above, in the analog modulation of light of Kappel, it is inherent that the components of Kappel's light valves or spatial light modulators that variably transmit light are transitioned during a given laser pulse in order to produce grayscale. This is because each laser is pulsed ON during the entire time during which that color laser is used during a frame, i.e., one pulse is provided per laser source per frame (see col. 15, lines 19-28). For example, since there is only one pulse per frame for a given color laser, the transitioning of the mirrors of the DMD 642 must occur during a given laser pulse in order to create a grayscale in the projected light. Accordingly, Kappel does not describe that elements of a spatial light modulator are transitioned substantially during an interpulse period, as is recited. Kappel's pulsing is for the purpose of efficiently operating the laser sources and is unrelated to the modulation of the light to provide grayscale, other than to ensure that the laser is pulsed off when light from the laser is not to be used.

Thus, since Kappel does not disclose the recited modulation driver of claim 9, Kappel does not anticipate the invention as recited in claim 9. Therefore, it is respectfully submitted that the rejection is overcome and should be withdrawn.

Regarding independent claim 17, Kappel does not disclose "a spatial light modulator array coupled to said modulator driver, said array including a plurality of elements arranged to be illuminated by laser pulses from said pulsed laser source, each element configured in one of a first state, a second state that gates an illuminating pulse to provide a gated pulse, and a transition that has an associated transition interval between said first state and said second state, wherein said phase delay is selected so that transition intervals of modulator elements occur substantially in the interpulse period between light pulses, said modulator array outputting a modulated beam that comprises a plurality of gated pulses", as recited.

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Accordingly, for the same reasons described above, Kappel does not disclose the recited modulation driver of claim 17; thus, Kappel does not anticipate the invention as recited in claim 17. Therefore, it is respectfully submitted that the rejection is overcome and should be withdrawn.

Regarding independent claim 23, Kappel does not disclose "means for synchronizing a transition of said elements with said laser pulses so that transition intervals of said modulator elements occur substantially in the interpulse period between light pulses", as recited.

Accordingly, for the same reasons described above, Kappel does not disclose the recited modulation driver of claim 23; thus, Kappel does not anticipate the invention as recited in claim 23. Therefore, it is respectfully submitted that the rejection is overcome and should be withdrawn.

Since claims 2, 6, 12, 16, 20 and 24-26 are dependent upon one of independent claims 1, 5, 9, 17 and 23 which have been shown to overcome the rejection; thus, claims 2, 6, 12, 16, 20 and 24-26 also overcome the rejection due to at least their dependencies.

4. Claims 1-8 stand rejected under 35 U.S.C. § 102(e), as being anticipated by U.S. Patent No. 6,483,556 (Karakawa et al.).

Karakawa provides a pulsed laser video system having solid state red, green, and blue lasers as a source, with a projection screen having a two-channel image for the screen, and an optical fiber remote image delivery (see Abstract). The lasers in Karakawa are used via non-linear processes to create monochromatic sources of red, green and blue light. This is done by repetitive Q-switching of the primary laser source. The primary laser source is required to be high power to cause an efficient non-linear wavelength conversion process. Furthermore, Karakawa uses acousto-optical modulators to modulate the light produced by the lasers. Acousto-optical modulators are well known one-dimensional, analog modulators that provide a variable transmission of light to be projected to the screen.

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In contrast, independent claim 1 requires the step of "modulating said pulsed laser beam in an element of a spatial light modulator to gate a number of pulses corresponding to the grayscale level of said digital data, including transitioning said element substantially in an interpulse period between laser pulses", while independent claim 5 requires the step of "modulating said pulsed laser beam in a plurality of elements of a spatial light modulator to gate a number of pulses from each element corresponding to the grayscale level of said digital data for each pixel for each frame, including transitioning said elements substantially in an interpulse period between laser pulses, thereby providing a modulated beam".

The recited method describes a digital modulation technique in which a number of pulses are gated by an element of the spatial light modulator, the number of gated pulses corresponding to the grayscale level, and in which elements of the spatial light modulator are transitioned substantially during an interpulse period between laser pulses.

Karakawa does not disclose or teach gating a number of pulses corresponding to the grayscale level of digital data. Furthermore, Karakawa does not disclose or teach transitioning elements of a spatial light modulator in an interpulse period. Karakawa describes a well known analog modulation that variably transmits incident light to provide grayscale, i.e., Karakawa does not gate pulses of incident light to provide grayscale. Furthermore, Karakawa does not teach or suggest any relationship (stated or implied) between the laser's pulse rate and the modulation of light by the acousto-optical modulators 20. Karakawa's pulsing is for the purpose of providing the proper light content to the modulator and is unrelated to the modulation itself. Thus, Karakawa does not disclose or teach transitioning elements of a spatial light modulator in an interpulse period.

Thus, since Karakawa does not disclose or suggest the recited modulating steps of claims 1 and 5, Karakawa does not anticipate or render obvious the inventions as recited in claims 1 and 5. Therefore, it is respectfully submitted that the rejection is overcome and should be withdrawn.

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Since claims 2-4 and 6-8 are dependent upon one of independent claims 1 and 5, which have been shown to overcome the rejection; thus, claims 2-4 and 6-8 also overcome the rejection due to at least their dependency on claims 1 and 5.

Claim Rejections - 35 U.S.C. §103

5. Claims 3, 4, 7, 8, 10, 11, 13-15, 18, 19, 21, 22, 27 and 29 stand rejected under 35 U.S.C. § 103(a), as being unpatentable by U.S. Patent No. 5,704,700 (Kappel et al.). M.P.E.P. Section 2143.03 states that "[t]o establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art".

Claims 3, 4, 7, 8, 10, 11, 13-15, 18, 19, 21, 22, 27 and 29 are each variously dependent upon a respective one or independent claims 1, 5, 9, 17 and 23. As discussed above, these independent claims variously recite that "a pulsed laser beam is modulated in an element(s) of a spatial light modulator to gate a number of pulses corresponding to the grayscale level of said digital data" (see claims 1, 5 and 17), and/or that the modulation in the spatial light modulator is such that the element(s) of the spatial light modulator are transitioned substantially occur during the interpulse periods of the series of pulses provided by a pulsed laser source (see claims 1, 5, 9, 17 and 23).

It has been shown above that Kappel does not disclose such features and that Kappel teaches well known analog modulation that variably transmits a single pulse of laser light per color per frame to produce a grayscale image during that frame, i.e., Kappel does not gate a number of pulses of incident light to provide grayscale. Further, there is no suggestion that Kappel could be modified to gate pulses in order to provide grayscale. The pulsing of the laser source is independent of the modulation techniques used to provide the grayscale and is for the purpose of efficiently operating the laser sources. Therefore, Kappel does not teach or suggest that the "pulsed laser beam is modulated in an element(s) of a spatial light modulator to gate a number of pulses corresponding to the grayscale level of said digital data", as is variously recited in

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claims 1, 5 and 17.

Furthermore, in the analog modulation of light of Kappel, it is inherent that the components of Kappel's light valves or spatial light modulators that variably transmit light are transitioned during a given laser pulse in order to produce grayscale. This is because each laser is pulsed ON during the entire time during which that color laser is used during a frame, i.e., one pulse is provided per laser source per frame (see col. 15, lines 19-28). For example, since there is only one pulse per frame for a given color laser, the transitioning of the mirrors of the DMD 642 must occur during a given laser pulse in order to create a grayscale in the projected light. Since Kappel leads one skilled in the art away from transitioning any elements of a modulator to produce grayscale, Kappel "teaches away" from the invention as claimed, which is prohibited by MPEP 2141.02. Accordingly, Kappel does not teach or suggest that element(s) of a spatial light modulator are transitioned substantially in an interpulse period, as is variously recited in claims 1, 5, 9, 17 and 23.

Thus, it is respectfully submitted that Kappel does not render independent claims 1, 5, 9, 17 and 23 obvious. Therefore, since claims 3, 4, 7, 8, 10, 11, 13-15, 18, 19, 21, 22, 27 and 29 are each variously dependent upon a respective one or independent claims 1, 5, 9, 17 and 23, it is respectfully submitted that the rejection is overcome and should be withdrawn.

New Claims

6. Newly submitted claims 29-40 are believed to be allowable because they are directed to that which is not shown or suggested the prior art. Support for new claims 29-40 can be found in the application as originally filed. For example, support for new claims 29, 31, 33, 36 and 38 can be found at least at page 8, line 12, page 15, line 5, page 17, line 11 and FIG. 2D. Support for new claims 34, 37 and 39 can be found at least in originally filed claims 1 and 5. Support for new claims 30, 32, 35 and 40 can be found at least in FIGS. 2D and 2E and the accompanying text.

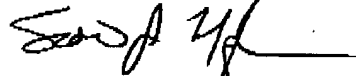
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CONCLUSION

Applicants submit that the above amendments and remarks place the pending claims in a condition for allowance. Therefore, a Notice of Allowance is respectfully requested.

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Respectfully submitted,



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